

A European study of bank interest margins: Is net fees revenue a determinant ?[†]

Emmanuelle NYS^{a,b}

^aCentre de Recherche en Macroéconomie Monétaire, University of Limoges, France

^bDepartment of Economics, University of Birmingham, U.K.

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Abstract

The aim of this paper is to analyse the determinants of bank interest margins for twelve selected European countries during the period 1989-1999. We use the theoretical literature on net interest margins to specify which variables affect the margin, considering the evolution of bank income structure over the last two decades. The empirical results corroborate the usual theoretical findings, but we also observe an inversely effect of net fees income on bank interest margins. The latter result could be interpreted as a possible subsidisation of the lending rate by the sale of services.

JEL Classification : G21, G10

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* E-mail address : emmanuelle.nys@unilim.fr, tel : + 33 (0)5.55.43.69.37, 4, place du présidial, 87031 Limoges Cedex, France

1. Introduction

Bank interest margins or net interest margins as it is commonly called – which are defined as the difference between interest revenue and interest expense as percentage of total assets¹ – vary widely across banks, both within and across countries. In table 1, for the years 1989-1999, are shown the net interest margins (NIMs) for a sample of commercial banks from 12 European countries all belonging to the European Economic Union. For example, in 1998, the mean NIM for Denmark (4.237%) is over twice that for Netherlands (1.588%). Denmark has the highest mean NIM over the period, as well as Spain until the middle of the period and then Italy. France, Germany and UK have roughly the same NIM over the period 1993-1999.

Table 1. Net Interest Margins : basic statistics ^{a,b}

		89	90	91	92	93	94	95	96	97	98	99
Belgium	mean	1.909	1.710	1.647	1.781	1.924	1.820	1.981	1.969	1.726	2.136	2.409
	std dev	1.781	1.172	1.166	1.166	1.823	1.575	1.820	1.775	1.533	2.200	2.724
Denmark	mean	4.446	4.608	4.270	4.963	5.189	5.143	4.905	4.594	4.356	4.237	4.209
	std dev	1.279	1.524	1.541	1.640	1.574	4.466	2.027	1.915	1.821	1.804	1.818
France	mean	3.061	2.950	3.155	3.608	3.341	3.059	2.992	3.041	2.953	2.935	2.637
	std dev	1.796	2.474	1.865	2.379	3.014	2.080	1.977	2.300	2.585	2.604	2.194
Germany	mean	3.914	3.646	3.948	2.636	2.510	2.731	2.599	2.681	2.316	2.365	2.162
	std dev	8.086	6.461	6.952	1.993	1.885	2.187	2.156	2.650	2.271	2.334	1.775
Greece	mean	4.998	5.903	4.049	NA	3.410	2.504	2.676	2.831	2.976	2.664	2.423
	std dev	1.119	1.804	2.169		1.937	1.557	1.720	1.284	1.059	0.886	0.880
Ireland	mean	NA	NA	NA	3.653	3.077	2.261	2.596	2.132	1.767	1.860	1.676
	std dev				1.511	1.523	1.444	2.086	1.491	1.240	1.281	1.399
Italy	mean	3.474	3.513	3.517	3.789	3.864	3.761	4.146	3.688	3.160	3.029	2.698
	std dev	0.993	1.071	1.101	1.150	1.217	1.187	1.224	1.073	1.201	0.889	0.939
Luxembourg	mean	0.335	0.306	0.561	0.729	0.952	0.894	0.851	0.822	0.817	1.016	0.940
	std dev	1.536	1.126	1.185	1.185	0.619	0.458	0.423	0.435	0.264	2.030	1.109
Netherlands	mean	1.463	1.383	1.588	1.396	1.683	1.546	1.526	1.394	1.344	1.588	1.639
	std dev	1.215	1.273	1.299	0.751	1.889	0.883	0.781	0.687	0.605	0.795	0.869
Portugal	mean	3.064	4.274	4.467	3.533	3.145	2.832	2.235	2.057	1.986	1.928	2.006
	std dev	1.176	1.962	1.698	1.119	1.053	1.745	1.141	1.108	1.268	1.117	1.396
Spain	mean	4.084	4.177	4.171	4.841	3.970	3.460	3.976	3.471	3.092	2.887	2.629
	std dev	1.902	2.389	2.585	4.836	2.355	1.780	2.720	2.431	1.998	2.064	1.744
UK	mean	2.453	2.741	4.160	2.868	3.015	2.803	2.864	2.864	2.897	3.262	2.815
	std dev	1.641	1.881	3.058	2.867	3.614	3.285	3.297	3.456	3.450	4.763	2.920

Source : Fitch IBCA (1997, 2001)

^a The sample is issued from two Cd of the Bankscope database. More precisely data from 1989 to 1991 comes from a different Cd than the data from 1992 to 1999. Therefore, the value obtained for the first three years might be quite different from the ones that are following. The case is the same for the next table.

^b The number of observations for each country and each year is displayed in appendix A, table 5.

¹ Spread is the difference between the yield rate on average interest earning assets and the cost rate on interest bearing funds, with both elements expressed in percentage terms.

When studying the literature, it is not clear if high margins are good or bad from a social welfare perspective. As it is stated by Saunders and Schumacher (2000), on the one hand, narrow margins may be indicative of a relatively competitive banking system with a low level of intermediation costs and regulatory (e.g. reserve requirements and capital requirements). On the other hand, relatively large margins may bring a degree of stability for a banking system, in that they can add to the profitability and capital of banks so as to insulate them from macro and other shocks. As is well known, bank failures can carry significant externalities and social costs.

This paper attempts to underline empirically, on a set of twelve European countries over the period 1989-1999, the determinants of net interest margin in the light of the substantial changes that have been undertaken in commercial banking in the last twenty years. Indeed over the last few years, the share of the non-interest income of banks' revenue has grown faster. For example, in Europe, the share of non-interest income increased² from 26% to

Table 2. Commissions and fees revenue as a percentage of total asset

		89	90	91	92	93	94	95	96	97	98	99
Belgium	mean	0.923	0.813	0.837	0.340	0.251	0.382	0.387	0.294	0.380	0.748	0.959
	std dev	0.460	0.540	0.764	0.473	0.487	0.599	0.737	0.598	0.593	1.313	1.972
Denmark	mean	NA	0.369	0.403	0.567	0.698	0.889	0.752	1.055	1.241	1.566	1.504
	std dev	NA	0.242	0.235	0.272	0.314	0.544	0.370	1.525	2.396	3.827	2.861
France	mean	1.066	0.938	0.828	1.392	1.608	1.792	1.482	1.610	1.850	1.955	2.424
	std dev	3.124	2.594	2.489	5.315	4.225	4.583	3.191	3.573	4.256	4.707	7.441
Germany	mean	3.540	3.816	4.708	1.068	2.812	1.201	1.198	1.193	1.243	1.685	1.685
	std dev	8.434	8.299	10.178	1.896	1.986	2.314	2.580	2.583	2.910	4.404	3.332
Greece	mean	NA	NA	1.458	NA	1.523	1.554	1.523	1.446	1.423	1.362	2.388
	std dev			1.252		0.954	0.747	0.800	0.816	0.809	0.543	1.698
Ireland	mean	NA	NA	NA	NA	0.577	0.529	0.586	0.820	0.685	0.461	0.426
	std dev					0.735	0.617	0.577	0.881	0.803	0.624	0.487
Italy	mean	0.606	0.684	0.704	0.822	0.691	0.760	0.733	1.514	1.141	1.277	1.483
	std dev	0.314	0.336	0.360	0.375	0.388	0.507	0.498	9.102	2.995	1.154	1.081
Luxembourg	mean	NA	NA	NA	0.331	0.540	0.663	0.672	0.649	0.801	1.194	1.072
	std dev				0.649	0.995	1.408	1.460	1.039	1.243	3.915	2.080
Netherlands	mean	0.709	0.615	0.615	0.694	0.717	0.782	0.770	0.769	0.788	1.113	1.685
	std dev	0.873	0.712	0.609	0.862	0.929	1.259	1.417	1.450	1.469	2.286	3.769
Portugal	mean	2.566	0.493	0.682	0.447	0.449	0.505	0.409	0.425	0.597	0.686	0.960
	std dev	1.330	0.515	0.501	0.307	0.242	0.322	0.423	0.314	0.525	0.476	1.093
Spain	mean	0.568	0.784	0.981	0.812	0.767	0.810	0.776	0.635	0.761	0.956	1.091
	std dev	0.398	0.668	1.123	0.714	0.675	0.692	1.232	0.545	0.743	1.021	1.229
UK	mean	0.938	1.334	3.202	1.126	1.204	1.373	1.685	1.443	1.373	1.187	1.237
	std dev	0.614	2.005	6.814	1.507	1.779	2.304	3.539	2.951	2.705	2.702	1.459

Source : Fitch IBCA (1997, 2001)

² Based on data published in "EU Banks' Income Structure" prepared by the Banking Supervision Committee for the European Central Bank.

32% between 1989 and 1995, and from 32% to 41% between 1995 and 1998. In the same report, we find that fees and commissions represent by far the most important component, accounting for 58 % of all non-interest income³. However the relative importance of this source of income has recorded a slight downward trend over the period 1994-1998. In table 2, is shown the net commissions and fees revenue as a percentage of total asset. In 1998, for example, net fees revenue as for France (1.955%) is over twice that for Spain (0.956%). France, Germany and UK have the higher ratio net fees revenue on total asset. We wonder if the sale of services may affect the strategy of banks when setting price for their traditional activity.

Two modelling frameworks have been used to study the determinants of bank interest margins. The dealership approach views banks as risk-averse dealers in the loan and deposit markets where loan requests and deposit funds occur nonsynchronously at random time arrivals⁴. Bank interest margins are shown to be fees charged by banks for the provision of liquidity. This model has been developed by Ho and Saunders (1981) and further extended by number of other researchers such as Allen (1988), McShane and Sharpe (1985), Angbazo (1997). The alternative approach is the micro-model of the banking firm – based originally on the approach of Klein (1971) and Monti (1972) – which views the banking firm in a static setting where demands and supplies of deposits and loans simultaneously clear both markets, see for example Zarruck (1989), Wong (1997), Goyeau *et al.* (1999).

This paper is organised as follows : in section 2 we will present a short review of the literature on determinants of banks interest margins. Then section 3 will discuss the data and sample, as well as the results found in the case of twelve European countries. Finally, section 4 concludes.

³ This figure is a EU weighted average for the period 1993-1998. Three countries, Austria, Finland and Sweden, are included in this average but are not present in our study.

⁴ It is a model of bid-ask prices for security dealers (see Stoll 1978) applied to the analysis of bank interest margins.

2. Determinants of net interest margins

2.1. A review of the literature

In the dealership approach, the bank is viewed as a dynamic dealer, setting interest rates on loans and deposits to balance the asymmetric arrival of loan demands and deposit supplies. A bank is viewed paying for funds (deposits) at one price (a “bid” price) and lending funds at another (the “ask” price).

Financial economists, such as Ho and Stoll (1980), have studied the determination of the bid-ask prices as a function of the characteristics of the security, as well as the inventory policy of the trader. Ho and Saunders (1981) analyse the bank’s brokerage function, adapting the finance literature on broker bid and ask spreads, to explain bank margins, that is the spread between the bid and ask price⁵. The purpose of the model is to provide a simple framework for characterizing the risk factors that influence bank net interest margins determination.

In the Ho and Saunders model, the bank is viewed as a dealer in the credit market acting as an intermediary between the demanders and suppliers of funds. The planning horizon is a single period during which bank rates, which are posted prior to observing the demand for immediacy, are held constant, and a single transaction in loans and deposits occurs. Furthermore, the authors also assume that the bank maximises its expected utility of terminal wealth.

The authors find the following net interest margin :

$$s = \frac{a}{b} + \frac{1}{2} R \sigma_i^2 Q .$$

⁵ This model has been further extended by Allen (1988), who considers loan heterogeneity, and Angbazo (1997), who introduces default risk.

The ratio a/b provides some measure of the producer's surplus or monopoly rent element in bank spreads or margins. The second term is a first-order risk adjustment term and depends on three factors : (i) R , the bank management's coefficient of absolute risk aversion; (ii) Q , the size of bank transactions; and (iii) σ^2 , the instantaneous variance of the interest rate on deposits and loans, i.e. the variability of interest rates. The second term implies that, ceteris paribus, the greater the degree of risk aversion, the larger the size of transactions and the greater the variance of interest rates, the larger bank margins are.

The framework employed by Ho and Saunders was originally intended for the analysis of the trading activities of security dealers. As stated by Zarruk (1989), they thus fail to consider some appropriate aspects of a bank's operation. Therefore, in his model of the bank interest margin, the bank is viewed as a firm in a static setting where demands and supplies of loans and deposits simultaneously clear both market. He used a framework similar to the one employed by Sealey (1980), who introduced risk and cost considerations to the firm theoretic approach developed by Klein (1971) and Monti (1972).

The model to be used in this paper assumes a firm-theoretical approach, which have been developed by Zarruk (1989), Wong (1997), and Goyeau, Sauviat and Tarazi (1999). The main results obtained by these three articles conclude that the optimal bank interest margin is larger when the bank is risk averse than when the bank is risk neutral and that a size-preserving increase in the bank's market power increases the optimal interest margin. They also find that under a decreasing absolute risk aversion utility function, an increase in the marginal administrative cost of loans will increase the optimal bank interest margin; an increase in the money market interest rate on the optimal bank interest margin is either positive or ambiguous depending on whether the bank is a net borrower or a net lender in the central monetary market, respectively; a mean-preserving increase in credit risk will increase the optimal bank interest margin; and finally if the interest rate risk is not severe, an increase in the bank's equity capital will decrease the optimal bank interest margin (otherwise the effect is ambiguous).

In other words, the authors find that the optimal interest margin is positively related to the bank's market power, to operating costs, to the degree of interest rate risk, and to the degree of credit risk. However, the effect of changes in the money market interest rate on

the optimal margin is ambiguous and depends on the bank's net position in the Central monetary market. Furthermore, the bank's equity capital is negatively related to the margin when interest risk is trivial.

The optimal bank behaviour can be captured through the bank interest margin which can be estimated with the implicit solutions obtained for the loan rate and for the quantity of issued deposits⁶. The net interest margin is computed as the difference between the implicit rate on assets, r_A , and the implicit rate on liabilities, r_P . Margins are defined ex-post in the sense that they incorporate the actual realisations of non-performing loans, γ is the proportion of non-performing loans in the loan portfolio at the end of the period :

$$\text{NIM} = r_A - r_P = \frac{(r_B + r_L(1-g)L)}{B+L} - \frac{r_D D}{K+D}$$

where L represents risky non-tradable loans, D deposits, K equity variable, B the bank's net position in the central monetary market, r_B the lending rate, r_D the deposit rate and r the risk free rate.

2.2. Empirical specification

Before specifying our test, we are going through some empirical studies in order to determine which variables are empirically relevant as determinants of the net interest margins.

Based on the dealership approach, Angbazo (1997) undertakes an empirical study on American commercial banks for 1989-1993⁷. The empirical specification focuses on the reported net interest margins which is assumed to be a function of the desired spread, but also on bank specific factors. The author explores the relationship between net interest margins and the risk factors which banks face when providing immediacy. The empirical specification retains default risk and interest rate risk as risk factors, and liquidity risk, capital base, implicit interest payments, non-interest bearing reserves, management quality,

⁶ Wong (1997) supposes that the bank is price market on the loan market which is imperfect, and quantity setter on the deposit market where the supply of deposits is perfectly elastic.

⁷ Angbazo (1997) includes default risk in the Ho and Saunders model, he obtains the following pure lending spread : $s = \frac{a}{b} + \frac{1}{4} R [(Q + 2L_0) s^2(L) + 2Q s^2(C) + 2(C_0 - Q) s(CL)]$ where $\delta^2(L)$ is a measure of pure default risk, and $\delta^2(C)$ a measure of money market interest risk.

and branching restrictions as bank-specific control variables. Default risk is measured as the ratio of net charge-offs on average loans, and interest rate risk exposure is the net position in short term assets deflated by the book value of total equity capital.

As Angbazo, Drakos (2003) similarly studies the banking system efficiency of Central and Eastern European countries and Former Soviet countries using a dealership approach. The explanatory variables retained by the author are interest rate risk, liquidity risk, and default risk. He also takes into account a financial leverage that will account for differences in the financial profile of the institutions, as well as two dummy variables for state owned banks and foreign banks.

Goyeau *et al.* (1999) apply the firm theoretic approach in the context of Central and Eastern European countries. They are able to specify two groups of factors that influence the net interest margin. The first one contains the variables which explain the desired spread, under uncertainty, this set of variables reflects the mark-up required by banks to compensate their exposure to interest rate risk and credit risk. The second group is assumed to capture the effects of operating costs, prudential regulation, and the effects of active portfolio reshuffling.

The aim of our study is to determine which variables explained the net interest margins. We therefore combined both approaches in order to underline which one are empirically significant. A first set of risky factors includes default risk, interest rate risk and liquidity risk. A second set of bank specific variables consists of a financial leverage, administrative costs, opportunity cost. We consider as well net fees income that is likely to impact banks margin. Our aim is to detect a potential effect of the sale of services using a traditional modelling of the banking firm. We thus take into account net fees revenue as an explanatory variable, as others have retained implicit interest (see for instance the empirical studies of Angbazo (1997), Saunders and Schumacher (2000)).

In general form :

$$\text{NIM}_{it} = f(\text{interest rate risk, liquidity risk, credit risk, administrative costs, opportunity cost, equity capital, net fees})$$

3. Empirical analysis

3.1. Sample and data

The empirical study is carried out for 12 European countries (Belgium, Denmark, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain and UK). The data for this study have been obtained from IBCA and their Bankscope database which provides series from individual bank balance sheets and income statements. The database is yearly data and covers the period 1989-1999. More precisely, the sample includes commercial banks only, i.e. institutions relying more heavily on loan and deposit activities in order to focus on intermediation, banking generating interest margins. Appendix B provides summary statistics (average) on key characteristics. One of the main advantage of the Bankscope Database is its attempt to standardise financial statements across countries, so as to enable reasonable cross-country comparison⁸. Interest rate series are those supplied by Datastream and by the OECD.

The banking market considered in this study are rather concentrated apart from Luxembourg (see table 3). In all these countries, the five largest commercial banks weighted, in 1998, from 37 to 95 % in aggregate assets.

Table 3. Concentration ratios

	Number of commercial banks	C(5) index ^a		Number of commercial banks	C(5) index
Belgium	55	0.95	Italy	154	0.55
Denmark	51	0.94	Luxembourg	129	0.37
France	314	0.63	Netherlands	63	0.89
Germany	246	0.82	Portugal	45	0.59
Greece	22	0.81	Spain	115	0.76
Ireland	27	0.81	UK	211	0.50

^a C(5) definition: for each country, market share of the five largest banks in terms of total assets.

⁸ If Ehrmann *et al* (2002) argue that the Bankscope database suffers from a composition bias compared to the databases collected by the respective national central banks, Fitch-IBCA has proceed to the construction of a consistent database for reasonable cross-country comparison.

3.2. Empirical variables

As explained before, we have kept in this paper the explanatory variables that have been underlined in the two approaches developed above. The aim is to determine which variables influence, in a general empirical framework, the net interest margins. We define them below.

The net interest margin is measured by the ratio net interest revenues (interest income – interest expense) to total assets.

Interest rate risk arises because given their maturity and their rate definition, assets and liabilities will be affected differently by market interest rate variation. Therefore a measure of the interest rate risk should express the maturity gap. Consistent with Flannery and James (1984) and Angbazo (1997), the standard measured exposure is the net position in short term assets (12 months or less) deflated by the value of equity capital. Unfortunately, such a variable cannot be worked out from the data available for our countries. In fact the variables that can be calculated can only implicitly capture effects related to bank balance sheet structures, and thus transformation risk, without explicitly distinguishing interest rate risk from liquidity risk. The latter is the risk of not having sufficient cash or borrowing capacity to meet deposit withdrawals or new loan demand, thereby forcing banks to borrow emergency funds at excessive cost. The ratio of loans to the bank's customer and short term funding is used as a proxy of the transformation risk. Thus, the higher the level of loans, the greater the premium in the net interest margins.

The credit risk exposure is measured by the proxy ratio of loan loss provisions to gross loans. Estimations were also carried out using the ratio loan loss reserves to gross loans, however this ratio is not available for all countries. Whenever the comparison was possible, either income statement (loan loss provisions) or balance sheet (loan loss reserves) information led to the same results. The idea is that banks whose loans are more risky will require a higher net interest margins to compensate for higher risk of default.

The interest rate of the central monetary market is approached by the three month money market rate. This variable, named opportunity cost, is supposed to capture substitution effects, that is substituting marketable assets for loans.

The capital ratio is measured by the ratio of equity capital to total loan. Since equity is more expensive funding source than debt⁹, an increase in equity capital may increase the average cost of capital. Therefore, a higher net interest margins could be required ex-ante.

The variable reflecting changes in administrative costs is defined as the sum of personnel expenses and non-interest expenses deflated by total assets. The theoretical model suggests that the administrative cost of loans should be separated of the administrative costs of issuing deposits. Unfortunately the data set does not allowed for such a distinction.

The revenue from the sale of services is measured as the net commissions and fees revenue (i.e. commissions and fees income less commissions and fees expense) deflated by the total of assets. We do not include income from securities, net profit (loss) on financial operations and other operating income, as it would not fit in our definition of services sold by banks.

3.3. The results

3.3.1. Effect of standard determinants

The goodness of fit coefficients (R^2) are reasonably high, between 0.33 and 0.93. However to analyse the results we should put more emphasis on the significance of t statistics.

For all countries, the bank interest margin reacts positively to the administrative costs variable, coefficients are significant at the 5% level apart from Luxembourg. The theoretical effect is thus not rejected, and therefore an increase in the administrative costs implies a higher bank interest margin.

⁹ Deposits can be described as debt for banks.

Table 4. OLS Regression. Dependant variable: Net Interest Margin^{a,b,c}

	Belgium	Denmark	France	Germany
Constant	-0.0001 (-0.050)	-0.025 (-7.472)**	0.005 (3.116)**	0.006 (2.424)**
Opportunity cost	-0.0009 (-3.565)**	0.0006 (2.176)**	0.0004 (2.942)**	0.00005 (0.210)
Capitalisation	0.0007 (0.288)	0.048 (6.128)**	-0.002 (-1.339)	-0.0009 (-0.840)
Administrative costs	0.836 (7.447)**	1.084 (17.30)**	0.675 (11.87)**	0.922 (11.30)**
Default risk	0.0005 (2.063)**	0.0007 (1.873)**	0.0005 (3.539)**	0.111 (3.482)**
Transformation risk	0.027 (7.423)**	0.039 (8.784)**	0.006 (4.442)**	0.004 (1.782)*
Fees	-0.429 (-3.426)**	-0.913 (-6.095)**	-0.453 (-5.054)**	-0.748 (-6.779)**
R squared	0.77	0.78	0.45	0.53
Observations	226	297	1721	1121

	Greece	Ireland	Italy	Luxembourg
Constant	0.004 (0.674)	-0.005 (-1.246)	-0.00007 (-0.030)	0.0007 (0.521)
Opportunity cost	0.0004 (1.680)*	-0.0005 (-1.501)	0.0008 (8.428)**	0.0005 (2.929)**
Capitalisation	-0.015 (-1.238)	0.022 (1.121)	0.010 (3.302)**	0.014 (3.029)**
Administrative costs	0.481 (5.728)**	0.810 (13.30)**	0.888 (23.24)**	0.111 (1.274)
Default risk	-0.001 (-2.374)**	0.004 (2.593)**	0.0002 (0.615)	-0.001 (-4.822)**
Transformation risk	0.003 (0.352)	0.019 (3.461)**	0.004 (1.860)*	0.008 (3.969)**
Fees	0.512 (3.423)**	-0.983 (-5.705)**	-0.554 (-7.615)**	-0.146 (-1.797)*
R squared	0.55	0.93	0.55	0.81
Observations	74	59	945	454

(continued on next page)

^a Figures in parentheses are the t-statistics, asterisks (**) and (*) indicate respectively significance at 5% and 10%.

^b All regression estimates are heteroskedastic consistent and are based on the revised covariance estimate of White.

^c For Ireland and Netherlands, the coefficient of correlation between the administrative costs and fees revenue is higher than 0.70. Both regressions have been corrected from multicollinearity.

Table 4. (continued)

	Netherlands	Portugal	Spain	Uk
Constant	0.014 (11.12)**	-0.002 (-0.760)	-0.009 (-2.011)**	-0.013 (-3.463)**
Opportunity cost	-0.0006 (-4.215)**	0.001 (6.078)**	0.001 (7.051)**	0.00009 (0.183)
Capitalisation	-0.004 (-1.344)	0.007 (2.406)**	0.016 (3.019)**	0.014 (7.823)**
Administrative costs	0.177 (3.593)**	0.414 (3.343)**	0.585 (5.297)**	1.019 (20.54)**
Default risk	0.235 (3.559)**	0.172 (3.985)**	0.003 (1.184)	0.00001 (0.074)
Transformation risk	0.0003 (0.627)	0.017 (5.655)**	0.021 (4.471)**	0.034 (13.36)**
Fees	-0.194 (-3.708)**	-0.651 (-2.349)**	-0.464 (-3.111)**	-0.957 (-10.89)**
R squared	0.33	0.50	0.44	0.89
Observations	335	281	635	568

The transformation risk variable which has been retained as a proxy of interest rate risk has the expected positive sign in all the countries but the coefficient is not significant at the 5% level for two of them, Greece and Netherlands. We also observe that when the effect of transformation risk is not severe on the net interest margin we indeed find as shown in Wong (1997) that the capitalisation variable has a negative impact on the bank interest margins (see France, Germany, Greece and Netherlands). However, for none of these countries, the coefficient of the capital ratio is significant.

For Denmark, Italy, Luxembourg, Portugal, Spain and U.K., the variable which is a proxy for the capital requirement has the expected sign, with a significant effect. The coefficient is not significant for Belgium and Ireland. Thus, a higher capital ratio is compensated for these countries by a higher net interest margin.

The default risk proxy is positive and significant for eight of the twelve countries, that is Belgium, Denmark, France, Germany, Ireland, Netherlands and Portugal. For Spain and U.K. the coefficient is positive but not significant. However for Greece and Luxembourg, the coefficient is negative and significant. A negative effect of credit risk on the bank interest margin is inconsistent with the theoretical model. A possible explanation relates to asymmetric information which is not explicitly taken into account here. If riskier projects mean higher bank margins, then the probability of non-performing loans may increase.

Thus banks may choose to increase their monitoring on loans rather than increasing their margins.

The opportunity cost variable is significant for only eight of the twelve countries. The sign of the coefficient is either positive or negative, but mainly positive, and therefore the effect on bank interest margin is ambiguous. It may depend on the net position of bank on interbank market.

3.3.2. *Effect of the commissions and fees variable*

Finally, we look at the net fees variable, which has a significant and negative impact on net interest margins in all countries but Greece. In other words, results show a negative impact of the sale of services on the pricing of net interest margins. Then, what could induce such an impact ?

From the statistics presented in the introduction of the paper, we know that the empirical relationship between net fees and commissions revenue on total assets and net interest margins does not come from a positive trend in the former variable, and a negative one in the latter. Indeed net commissions and fees revenue has increased as a percentage of banks' income statement but not as a percentage of banks' total assets (this phenomenon could be explained by a competitive pressure on price between banks and possible other financial institutions).

The question raised now is how to explain such a relationship. The cross-subsidisation literature in the banking market may give some indications. Several authors, as Barro and Santomero (1972), Mitchell (1979), Whitesell (1992), and Tarkka (1995), have shown that deposit interest rate regulations have implied "implicit interest" in the form of services rendered at prices below cost. Chiapporri *et all* (1995) have modelled the effect of deposit rate regulation on the lending rate using a Salop setting framework, underlying the existence of subsidising sale. An alternative consideration of the fees and lending rate relationship could be Cukierman (1978) who showed that borrowers who are buying more services than others to a same bank are less prone to credit rationing. With regards to our study, that implies to consider the effect of the sale of services on the determination of the lending rate (most of deposit rates being still under regulation).

4. Conclusion

The aim of this paper was to analyse the behaviour of banks in terms of pricing strategy. Indeed, as mentioned previously, banking activity has dramatically changed over the last two decades : the share of non-interest income of bank revenue has become a substantial part of banks profit. We therefore wondered how determinants of net interest margins have been affected in European countries.

The dealership and firm theoretic models, as well as data availability, have led us to choose default risk and transformation risk as risk factors determinants. We have also included an opportunity cost, a capital ratio and an administrative costs variables. Our results show a positive and significant impact of default risk, administrative costs and opportunity costs in most European countries. In overall, the results found here are at least as good as those obtained in previous studies.

Finally, to take into account changes in banks profit, we have added a fee variable. The results show that services provision reduces the net interest margins. This finding invites us to determine the relationship between this two variables in the field of the cross-subsidisation literature we exposed earlier. If we observe an empirical effect on the net interest margin, a theoretical investigation may precise what can be the effect of services provision on the lending rate and possibly credit risk. Does the sale of services alter banks behaviour? Such a result would suggest to the authorities regulation to take the “non-traditional” activities of banks into consideration. If the revised regulation of the Cooke ratio, Basle accord, takes into account market risk exposure, it may not give enough emphasis to the services activity of banks – even if banks diversify their activities, they may not consider the possible effects on pricing strategy and risk.

References

Allen, L., 1988. The determinants of bank interest margins: A note, *Journal of Financial and Quantitative Analysis* 23, 231-235.

- Angbazo, L., 1997. Commercial bank interest margins, default risk, interest-rate risk, and off-balance sheet banking, *Journal of Banking and Finance* 21, 55-87.
- Barro, R., Santomero, A., 1972. Household money holdings and the demand deposit rate, *Journal of Money, Credit and Banking* 4, 397-413.
- Chiappori, P.A., Perez-Castrillo, D., Verdier, T., 1995. Spatial competition in the banking system: Localization, cross subsidies and the regulation of deposit rates, *European Economic Review* 39, 889-918.
- Cukierman, A., 1978. The horizontal integration of the banking firm, credit rationing and monetary policy, *Review of Economic Studies* 45(1), 165-178.
- Drakos, K., 2003. Assessing the success of reform in transition banking 10 years later: an interest margins analysis, *Journal of Policy Modeling*, *forthcoming*.
- Ehrmann, M., Gambacorta, L., Martinez-Pagés, J., Sevestre, P., Worms, A., 2002. Financial systems and the role of banks in monetary policy transmission in the euro area, *Notes d'Etudes et de Recherche* 93, Banque de France.
- European Central Bank, 2000. EU Banks' Income Structure, April.
- Flannery, M., James, C., 1984. The effect of interest rate changes on the common stock returns of financial institutions, *Journal of Finance* 39(4), 1141-1153.
- Freixas, X., Rochet, J.C., 1997. *Microeconomics of Banking*, MIT Press, Cambridge, Mass.
- Goyeau, D., Sauviat, A., Tarazi, A., 1999. Risque et marges d'intérêt optimales des banques commerciales d'Europe centrale et orientale, *Revue Economique* 50(6), 1255-1274.
- Ho, T., Saunders, A., 1981. The determinants of bank interest margins: Theory and empirical evidence, *Journal of Financial Economics* 9, 47-73.
- Klein, M., 1971. A theory of the banking firm, *Journal of Money, Credit and Banking* 3, 205-218.
- Madura, J., Zarruck, E.R., 1989. Bank spread with uncertain deposit level and risk aversion, *Journal of Financial and Quantitative Analysis* 27(1), 143-149.
- Mc Shane, R.W., Sharpe, I.G., 1985. A time series-cross section analysis of the determinants of Australian trading bank loan-deposit interest rate margins: 1962-1981, *Journal of Banking and Finance* 9, 115-136.
- Mitchell, D., 1979. Explicit and implicit demand deposit interest, *Journal of Money, Credit and Banking* 11(2), 182-191.
- Monti, M., 1972. Deposit, credit and interest rate determination under alternative bank objective functions, in: Karl Shell and Giorgio P. Szego, eds., *Mathematical methods in investment and finance*, North-Holland, Amsterdam, 431-454.

- Saunders, A., Schumacher, L., 2000. The determinants of bank interest margins: an international study, *Journal of International Money and Finance* 19, 813-832.
- Sealey, C.W. Jr., 1980; Deposit rate-setting, risk aversion, and the theory of depository financial intermediaries, *Journal of Finance* 35(5), 1139-1154.
- Stoll, H.R., 1978. The supply of dealer services in securities markets, *Journal of Finance* 33, 1133-1151.
- Tarkka, J., 1995. Approaches to deposit pricing: A study in the determination of deposit interest and bank service charges, *Bank of Finland Studies E:2*.
- Whiteshell, W., 1992. Deposit banks and the Market for Payment Media, *Journal of Money, Credit and Banking* 24(4), 483-498.
- Wong, K.P., 1997. On the determinants of bank interest margins under credit and interest rate risks, *Journal of Banking and Finance* 21, 251-271.
- Zarruck, E., 1989. Bank margin with uncertain deposit level and risk aversion, *Journal of Banking and Finance* 13, 797-810.

Appendix A.

Table 5. Number of observations

	89	90	91	92	93	94	95	96	97	98	99
Belgium	23	22	26	26	35	43	45	44	43	34	31
Denmark	14	16	18	33	36	43	48	49	49	49	47
France	121	133	141	237	265	276	274	264	242	225	178
Germany	57	67	90	111	160	186	195	202	199	181	142
Greece	6	6	8	5	7	11	11	13	19	17	14
Ireland	2	2	2	6	9	12	14	15	17	16	13
Italy	70	77	78	69	104	113	119	129	126	120	110
Luxembourg	35	63	71	75	97	104	104	107	107	102	98
Netherlands	27	28	29	35	41	49	54	55	48	44	37
Portugal	6	13	16	32	33	34	39	41	41	38	32
Spain	62	73	83	57	61	63	74	93	97	92	83
UK	13	17	25	104	130	135	148	161	149	141	119

Source : Fitch IBCA (1997, 2001)

Appendix B. Summary statistics.

Table 6. Descriptive Statistics

	Mean	Std. dev	Min	Max
Belgium				
Total Assets	\$ 15.83 B	\$ 43.71 B	\$ 52 M	\$ 342 B
Deposit / TA	89.27	4.87	0.53	0.95
Equity / TA	5.69	4.04	1.38	34.14
Loans / TA	35.84	18.38	10.03	85.67
Denmark				
Total Assets	\$ 3.88 B	\$ 13.56 B	\$ 34.3 M	\$ 94.5 B
Deposit / TA	83.05	3.72	59.70	91.06
Equity / TA	10.98	3.49	4.16	20.23
Loans / TA	56.43	12.96	10.39	82.04
France				
Total Assets	\$ 9.98 B	\$ 43.64 B	\$ 5.52 M	\$ 702 B
Deposit / TA	78.01	15.77	10.04	99.05
Equity / TA	8.61	9.60	0.02	80.19
Loans / TA	54.87	23.88	10.01	99.78
Germany				
Total Assets	\$ 6.45 B	\$ 27.99 B	\$ 10.8 M	\$ 289 B
Deposit / TA	77.60	18.12	10.25	99.01
Equity / TA	8.94	8.90	0.50	73.46
Loans / TA	50.39	22.71	10.09	99.11
Greece				
Total Assets	\$ 6.42 B	\$ 10.97 B	\$ 88 M	\$ 46.55 B
Deposit / TA	85.40	6.50	58.23	95.58
Equity / TA	8.53	4.78	0.14	28.41
Loans / TA	40.67	11.97	11.54	71.91

(continued on next page)

Table 6. (continued)

	Mean	Std. dev	Min	Max
<i>Ireland</i>				
Total Assets	\$ 7.84 B	\$ 13.49 B	\$ 117 M	\$ 65.55 B
Deposit / TA	82.87	17.53	12.59	98.25
Equity / TA	9.18	13.15	0.63	86.55
Loans / TA	55.10	19.83	12.71	85.51
<i>Italy</i>				
Total Assets	\$ 11.48 B	\$ 30.21 B	\$ 35.9 M	\$ 330 B
Deposit / TA	76.64	8.91	16.23	96.63
Equity / TA	8.63	4.04	0.62	35.91
Loans / TA	47.12	10.67	10.60	97.27
<i>Luxembourg</i>				
Total Assets	\$ 4.51 B	\$ 6.68 B	\$ 47.9 M	\$ 37.2 B
Deposit / TA	87.25	9.82	11.81	97.09
Equity / TA	5.03	4.79	0.90	48.01
Loans / TA	30.05	17.46	10.00	94.79
<i>Netherlands</i>				
Total Assets	\$ 18.22 B	\$ 61.33 B	\$ 25.9 M	\$ 504 B
Deposit / TA	80.44	16.15	13.59	96.68
Equity / TA	6.95	5.33	0.85	62.46
Loans / TA	52.15	22.77	10.90	99.73
<i>Portugal</i>				
Total Assets	\$ 6.48 B	\$ 10.02 B	\$ 53.4 M	\$ 57.6 B
Deposit / TA	79.96	13.81	15.72	98.18
Equity / TA	9.28	7.80	0.20	64.62
Loans / TA	45.90	15.05	11.22	83.78
<i>Spain</i>				
Total Assets	\$ 10.44 B	\$ 29.77 B	\$ 16.4 M	\$ 237 B
Deposit / TA	81.91	13.43	11.85	97.04
Equity / TA	10.95	11.00	0.35	79.31
Loans / TA	51.25	20.11	10.09	99.05
<i>UK</i>				
Total Assets	\$ 5.53 B	\$ 12.96 B	\$ 8.3 M	\$ 164 B
Deposit / TA	77.29	14.71	10.24	99.22
Equity / TA	12.69	10.32	0.42	71.04
Loans / TA	50.53	27.62	10.04	99.22

Source : Fitch IBCA (1997, 2001)

All figures are in percentages unless stated otherwise.